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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 761,240	01 17 2001	Josef-Georg Bauer	GR 98 P 2124 P	5138

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EXAMINER

MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 11 27 2002

Please find below and or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/761,240

Applicant(s)

BAUER ET AL.

Examiner

Johannes P Mondt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on 17 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Information Disclosure Statement***

The Information Disclosure Statement (IDS) submitted on 7/19/2002 and entered as Paper No. 11 was filed after the mailing date of the Non-Final Rejection as First Action On the Merits on 5/15/2002. The submission is in compliance with the provisions of 37 CFR 1.97(c). Accordingly, the examiner has considered the Information Disclosure Statement.

### ***Response to Amendment***

Amendment C filed 9/17/2002 and entered as Paper No. 13 forms the basis of the present Office Action. Comments to Applicant's Remarks are included below in "Response to Arguments", said comments being in light of said Amendment C of Paper No. 13 and said Information Disclosure Statement of Paper No. 11.

### ***Response to Arguments***

1. Applicant's arguments filed 9/17/2002 have been fully considered but they are not persuasive. In particular, with regard to the rejection under 102(e) over Francis et al of claim 1, Applicant states that "no stop zone having atoms of a doping substance determining a conductivity of said stop zone in device as defined in claim 1 is shown nor suggested". This statement is equivalent with the statement that Francis et al do not anticipate (nor render unpatentable in case of a suggestion) claim 1, because if and

only if the above quoted statement is false with regard to showing do Francis et al anticipate claim 1. However, Applicant provides no details as to why the above statement is true. The examiner can only repeat his rejections and the reasons therefore, namely, the teaching by Francis et al of a power semiconductor element comprising an emitter region 11, a zone 12 in front of the emitter region, with mutually opposite conductivity types, and said zone having atoms of a doping substance determining a conductivity of 12, said atoms having at least one energy level within the bandgap of the semiconductor and at least 200 meV away from both a conduction band and a valence band edge of the semiconductor (region 12 is made of silicon while it is inherent that the atomic energy level of gold and of platinum are located  $> 200$  meV away from both the conduction and valence band; cf. S.M. Sze, "Physics of Semiconductor Devices", John Wiley & Sons, Inc., Chapter 1, section 1.4.2 Donors and Acceptors, Figure 13). It is noted that zone 12 is made to have a uniformly damaged lattice by virtue of being a Si/Ge region (with about 1% in weight of germanium) for the very purpose to permit the positioning of atoms in order to reduce inter alia the power loss (cf. column 1, lines 50-55). Therefore, it is clear that the zone 12 does contain said ions. In summary, there is no material difference between zone 12 affected by said ion implantation in the invention by Francis and the stop zone layer in the invention or any other aspect of the invention as formulated in the current claim 1. Therefore, the rejection of claim 1 as being anticipated by Francis is herewith repeated, although the examiner realizes that the purpose of the ions implanted in the device taught by Francis

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is different from that of Applicant (lifetime killing rather than reduction of the blocking voltage).

Finally, the present office action also includes new grounds of rejection for claims 1-4 based on the Information Disclosure Statement of Paper No. 11, in particular Stephani et al (EP 0 760 528 A2).

### ***Claim Objections***

2. **Claims 2-3** are objected to because of the following informalities: "said foreign atoms" (claim 2, line 2; claim 3, line 2) should be replaced by "said atoms". Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1-4** are rejected under 35 U.S.C. 102(b) as being anticipated by Stephani et al (EP 0 760 528 A2). Stephani et al teach (cf. Figure 1) a power semiconductor element (see title and "Beschreibung", column 1 – column 2, line 8), comprising:

an emitter region 2;

a stop zone 4 in front of the emitter region, said emitter and stop zone having opposite conductivity types; and

said stop zone having (foreign (claim 4)) atoms of a doping substance determining a conductivity of said stop zone (column 3, line 54 – column 4, line 3), said atoms of said doping substance having at least one energy level within the band gap of the semiconductor and at least 200 meV away from both a conduction band and valence band of the semiconductor (claim 1), namely, in the case when the emitter zone is p-type and the abutting stop zone is consequently n-type, preferred atoms include sulfur (S) (donor level: 260 meV) (claims 2 and 4) and selenium (Se) (250 meV) (claims 3-4). Both selenium and sulfur have at least one energy level within the band gap of silicon (Si) and are spaced at least 200 meV from the conduction band and valence band (edge) of silicon, while silicon is the semiconductor of which both regions 2 and 4 are made (claim 4). In conclusion, then, Stephani et al anticipate claims 1-4.

3. **Claims 1 and 3-4** are rejected under 35 U.S.C. 102(b) as being anticipated by Gerstenmaier et al (DE 3917769 A1). Gerstenmaier et al teach (cf. Figure 1) a power semiconductor element (cf. title and abstract, and "Beschreibung"), comprising (cf. column 1, line 49 – column 3, line 53) an emitter region 4 (cf. column 1, lines 49-57), a stop zone 11a/11b in front of the emitter region, said emitter region and said stop zone having mutually opposite conductivities (cf. column 2, lines 3-5), and said stop zone having atoms of a doping substance determining a conductivity of said stop zone, said atoms of said doping substance having at least one energy level within the band gap of the (silicon) (cf. column 1, line 50) semiconductor and at least 200 meV away from a

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conduction band and valence band of the semiconductor (claim 1), namely selenium (cf. column 3, lines 17-18) (claim 3). Said stop zone contains foreign atoms (selenium in silicon, for instance) from the group selected from sulfur and selenium with at least one energy level within the band gap of the semiconductor and spaced at least 200 meV from a conduction band and valence band of the semiconductor (claim 4). In conclusion, Gerstenmaier et al anticipate claims 1 and 3-4.

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

4. **Claim 1** is rejected under 35 U.S.C. 102(e) as being anticipated by Francis et al (6,043,112). Francis et al teach (Figure 1) a power semiconductor (silicon; cf. column 2, line 39) element comprising an emitter region 11 (cf. column 2, lines 1-7); a stop zone 12 (cf. column 1, 46-63 and column 2, lines 2-7) in front of said emitter region and said emitter region and stop zone having opposite conductivity types; and said stop zone having gold atoms, or, in the alternative, platinum atoms (cf. column 2, lines 32-47) i.e., foreign atoms with at least one energy level within the band gap of the semiconductor and at least 200 meV away from both conduction and valence band of the semiconductor (region 12 is made of silicon while it is inherent that the atomic energy level of gold and of platinum are located > 200 meV away from both the conduction and

valence band; cf. S.M. Sze, "Physics of Semiconductor Devices", John Wiley & Sons, Inc., Chapter 1, section 1.4.2 Donors and Acceptors, Figure 13). It is noted that the N+ buffer layer 12 is made to have a uniformly damaged lattice by virtue of being a Si/Ge region (with about 1% in weight of germanium) so as to permit the positioning of ions in order to reduce inter alia the power loss (cf. column 1, lines 50-55), while thereby the conductivity of the region within which the aforementioned ions are implanted is determined inherently. Therefore, it is clear that the N+ buffer layer itself does contain said ions. In summary, there is no material difference between the buffer layer portion affected by said ion implantation in the invention by Francis and the stop zone layer in the invention or any other aspect of the invention as formulated in the current claim 1. In conclusion, then, Francis et al anticipate claim 1.

### ***Conclusion***

5. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 7/19/2002 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609(B)(2)(i). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM  
November 22, 2002

*[Handwritten signature]*  
Johannes P. Mondt  
Examiner  
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